



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 121, and 129

[Docket No.: FAA-2014-0500; Amdt. Nos. 25-142, 21-376, and 129-53]

RIN 2120-AK30

Fuel Tank Vent Fire Protection

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The FAA is amending certain airworthiness regulations for transport category airplanes to require fuel tank designs that prevent a fuel tank explosion caused by the propagation of flames, from external fires, through the fuel tank vents. This final rule requires a delay of two minutes and thirty seconds between exposure of external fuel tank vents to ignition sources and explosions caused by propagation of flames into the fuel tank, thus increasing the time available for passenger evacuation and emergency response. These amendments apply to applications for new type certificates and certain applications for amended or supplemental type certificates. The amendments also require certain airplanes produced in the future and operated by air carriers to meet the new standards.

DATES: Effective **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. The compliance date for the requirements in § 25.975 is **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE**

FEDERAL REGISTER]. The compliance date for the requirements in §§ 121.1119 and 129.119 is August 23, 2018.

ADDRESSES: For information on where to obtain copies of rulemaking documents and other information related to this final rule, see “How to Obtain Additional Information” in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this action, contact Mike Dostert, Propulsion and Mechanical Systems Branch, ANM-112, Transport Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 1601 Lind Ave. SW., Renton, WA 98057-3356; telephone (425) 227-2132; facsimile (425) 227-1149; e-mail Mike.Dostert@faa.gov.

SUPPLEMENTARY INFORMATION:

Authority for this Rulemaking

The FAA’s authority to issue rules on aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency’s authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, Subpart III, Section 44701, “General Requirements.” Under that section, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing regulations and minimum standards, for the design and performance of aircraft, that the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority. It prescribes new safety standards for the design and operation of transport category airplanes.

I. Overview of Final Rule

A. General

The FAA is amending title 14, Code of Federal Regulations (14 CFR) parts 25, 121, and 129 as described below. The intent of this rule is to prevent fuel tank explosions caused by ignition from external ignition sources of fuel vapor either contained in vapor spaces¹ or exiting from vapor spaces through the fuel tank vent outlets. Potential external ignition sources include, but are not limited to, ground handling equipment, fuel fires that result from refueling spills, or ground fires that follow a survivable crash landing in which the fuel tank and the vent system remain intact. Means to prevent or delay the propagation of flame² from external sources into the fuel tank through the fuel tank vent system³ would also prevent or delay fuel tank explosions following certain accidents. These means include flame arrestors or fuel tank inerting. This prevention or delay would provide additional time for the safe evacuation of passengers from the airplane and for emergency personnel to provide assistance.

This rule applies to applications for new type certificates and applications for amended or supplemental type certificates on significant product-level change projects in which § 25.975, “Fuel tank vents and carburetor vapor vents,” is applicable to a changed area. Additionally, a new operating requirement in both 14 CFR part 121, “Operating Requirements: Domestic, Flag, and Supplemental Operations,” and 14 CFR part 129,

¹ A vapor space is any portion of the airplane fuel tanks and the fuel tank vent system that, if such tanks and system held any fuel, could contain fuel vapor.

² Flame propagation is the spread of a flame in a combustible environment outward from the point at which the combustion started.

³ A fuel tank vent system is a system that ventilates fuel vapor from the airplane fuel tanks to the atmosphere. A fuel tank vent system ensures that the air and fuel pressure within the fuel tank stay within structural limits required by §25.975 (a).

“Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage,” applies to airplanes that are issued an original airworthiness certificate after a specified date. The FAA is not requiring retrofit of the existing fleet.

Concurrent with the publication of this rule, the FAA is publishing Advisory Circular (AC) 25.975-1 that provides guidance concerning means of compliance with the revised § 25.975.⁴

II. Background

A. Statement of the Problem

This rulemaking addresses the problem of fuel tank explosions caused by flame propagation from fires outside the airplane reaching the fuel tank through the fuel tank vents. Fires outside of the airplane fuel tanks can be caused by ignition of fuel spilled during refueling, fuel and oil spillage from engines that separate from the airplane following an accident, or fuel leaking from damaged airplane fuel tanks. In some cases, external fires have ignited fuel vapors that have exited the fuel tank vents, resulting in flames traveling back through the vent lines into the fuel tank and causing fuel tank explosions. These explosions have caused passenger fatalities and prevented emergency personnel from assisting survivors.

Existing requirements address some ignition sources. Airworthiness standards in § 25.981 for preventing fuel system explosions include requirements to prevent ignition sources inside the fuel tanks caused by failures of airplane components or external heating of the fuel tank walls. The fuel tank venting standards in § 25.975 include

⁴ AC 25.975-1 is available on the FAA website at http://www.faa.gov/regulations_policies/advisory_circulars/.

requirements to ensure fuel tank structural integrity following failures of the refueling system that could result in overfilling of the fuel tanks, or clogging of the vents due to ice. Section 25.954, “Fuel system lightning protection,” requires that fuel tank vents be designed and arranged to prevent the ignition of fuel vapor within the system by lightning strikes. These regulations, however, do not address the risk posed by flame from external ignition sources entering the fuel tank through the fuel vents.

Most new type designs and transport category airplanes currently in production include flame arrestors or other means to prevent flame propagation through the fuel vent lines into the fuel tanks. However, some models of newly manufactured airplanes produced under older type certificates and introduced into the U.S. fleet do not have a means of preventing fuel tank explosions caused by external ignition sources. In addition, lack of a specific part 25 regulation to address this has resulted in some applicants completing initial airplane designs and applying for a U.S. type certificate without having accounted for the risk of flame propagation through fuel vent lines.

B. History

These amendments stem from an industry study of potential post-crash survivability and FAA airworthiness actions in response to accidents that involved fuel tank explosions. The FAA has issued airworthiness directives (ADs) that require flame arrestors, or verification of their functionality, on several airplane models. In 1999, following a review of fuel tank explosions on older designs, the FAA issued an AD⁵ mandating incorporation of flame arrestors on Boeing Model 737 airplanes. That AD action eliminated the risk of fuel tank explosions from flames entering the fuel tanks

⁵ AD 99-03-04 BOEING: Amendment 39-11018; Docket 98-NM-50-AD (effective March 9, 1999).

through the fuel tank vents on early models of the Boeing 737. More recently, in 2008, the FAA issued an AD requiring installation of flame arrestors on the Lockheed Model 382.⁶

The Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee⁷ examined transport category airplane post-crash fires and determined that four fuel tank explosions resulting from post-crash fires could have been avoided if flame arrestors or surge tank explosion suppression systems⁸ had been installed in the airplane fuel tank vents.⁹ The SAFER Committee examined methods of preventing fuel tank explosions following impact in survivable accidents, including controlling the fuel tank flammability using nitrogen inerting systems, using fire suppression systems, and installation of flame arrestors.

The SAFER Committee determined the most practical means of preventing post-crash fuel tank explosions was the use of flame arrestors. Flame arrestors stop the flame from traveling through the fuel tank vents by quenching the flame. Flame arrestors are typically made of numerous small stainless steel passages that remove heat from the flame so it dies out before passing into the fuel tank. This delays propagation of ground fires into the fuel tank and subsequent explosions, providing additional time for the safe

⁶ AD 2011-15-02 LOCKHEED: Amendment 39-16749; Docket No. FAA-2010-1305 (effective August 19, 2011).

⁷ Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee Final Report, Volume 1, FAA-ASF-80-4, dated June 26, 1978, through June 26, 1980. A copy of this report has been placed in the docket of this proceeding.

⁸ Boeing developed surge tank explosion suppression systems that were installed on some Boeing airplanes to prevent a lightning strike from igniting fuel vapor in the fuel tank vent system. These systems used light sensors that activated the discharge of fire suppression agent into the vent surge tank to prevent the fire from traveling through the vents into the airplane fuel tanks.

⁹ SAFER Report, page 49, Figure 3.

evacuation of passengers. The two flame arrestors installed on a typical transport airplane weigh approximately 2 to 4 pounds each.

In 1995, based on the SAFER Committee report, the FAA issued an NPRM entitled, “Fuel System Vent Fire Protection,” (60 FR 6632), dated February 2, 1995. That NPRM proposed to require 5 minutes of fuel tank vent fire protection in new type designs for transport category airplanes, and amend certain operating rules to require retrofit of the existing fleet of transport category airplanes. The FAA received comments on the NPRM that questioned the proposed 5-minute standard and the accuracy of the economic analysis related to the proposed retrofit requirement. Comments also suggested that the FAA should develop additional guidance, in the form of an AC, to provide an acceptable method of qualifying flame arrestors as a means of meeting the proposed requirement.

To address those 1995 comments, the FAA obtained additional cost information from component suppliers, and drafted an AC that included a means of demonstrating compliance. That means of compliance was the installation of fuel tank vent flame arrestors that would prevent propagation of flames through the fuel tank vents into the fuel tanks for a minimum of 2 minutes and 30 seconds. In 2001, the FAA tasked its Aviation Rulemaking Advisory Committee (ARAC) to review a draft final rule, including the FAA’s proposed disposition of public comments, and the draft AC. In 2002, due to the ARAC tasking, the FAA published in the Federal Register a notice of withdrawal of the NPRM that had been published in 1995. Because of industry resource issues and FAA rulemaking prioritization activities, however, no work was done on these ARAC taskings. The FAA published a withdrawal of the tasks on June 21, 2004.

As an alternative, the FAA developed a strategy for a number of rulemaking projects that had been tasked to the ARAC. In 2005, the FAA issued a letter¹⁰ to the head of the Transport Airplane and Engine Issues Group describing the agency's intent to use the process under 14 CFR 21.21 of finding an unsafe design feature to address the need to prevent flame propagation through fuel tank vents. Since 2005, the FAA has used issue papers applicable to specific certification projects, which have resulted in the inclusion of flame arrestors in the design of new type certificated airplanes.

Prior to the FAA's issuance of the 2005 letter, however, many manufacturers had followed industry recommendations and voluntarily introduced flame arrestors into their new type designs.

However, some business jets and smaller transport category airplanes do not incorporate flame arrestors or other means to prevent flame propagation into the fuel tanks. Also, some airplanes operating under 14 CFR part 121 do not have such means, including older models like the DC-9 and MD-80, and all DHC-8 turboprops and Canadair Regional Jets, both of which are still in production. This amendment addresses those airplanes.

As discussed in the NPRM, the FAA based the 2 minute and 30 seconds, in part, on previous Aerospace Industries Association (AIA) comments to the NPRM the FAA published in 1995 that proposed a 5-minute standard. AIA stated that flame arrestors in production at that time could not meet the proposed 5-minute standard and that 5 minutes was overly conservative. Based on those comments, the FAA reviewed the capability and the service experience of in-production designs, as well as the conservatism of the flame-

¹⁰ John Hickey, Director, Aircraft Certification Service, to Craig Bolt, Assistant Chair, Transport Airplane and Engine Issues Group, 14 June 2005.

holding test methods used for evaluating flame arrestor performance. In 1996, the FAA determined that a 2 minute and 30 second capability allowed flame arrestors in production at that time to provide adequate evacuation and emergency response time. Since that time, under §§ 21.21(b)(2) and 25.601, the FAA has applied issue papers to new type certification projects that approved applicants' proposals to reduce the risk of fuel tank explosions by incorporating flame arrestors with a 2 minute and 30 second delay capability.

The FAA also reviewed other rules related to passenger safety when selecting the delay of 2 minute and 30 seconds for a fuel tank vent protection standard. Section 25.803, "Emergency evacuation," sets a performance-based standard that, under specified conditions, the airplane must be capable of being evacuated within 90 seconds. The conditions assume the availability of a minimum number of exits and that all passengers are uninjured and physically capable of departing the airplane. However, experience has shown that this is not always the case after an accident, so additional time is needed for passenger evacuation and emergency response.

Section 25.856, "Thermal/Acoustic insulation materials," sets minimum standards for preventing penetration of a fuel fire through the airplane fuselage, including testing requirements in appendix F of part 25 that require 5 minutes as the minimum burn-through time.¹¹ Studies of past accidents^{12, 13} show the greatest benefits in evacuating passengers and allowing emergency crews time to arrive are provided with a minimum

¹¹ This time includes 1 minute for a fire to penetrate the fuselage skin and an additional 4 minutes for the fire to burn through the insulation.

¹² DOT/FAA/AR-99/57, "Fuselage Burnthrough Protection for Increased Postcrash Occupant Survivability: Safety Benefit Analysis Based on Past Accidents," September 1999.

¹³ DOT/FAA/AR-09/18, "Determination of Evacuation and Firefighting Times Based on an Analysis of Aircraft Accident Fire Survivability Data," May 2009.

burn-through time of 5 minutes. However, flame arrestors that meet a 5-minute standard would need to be significantly larger and heavier than a flame arrestor meeting the 2 minute and 30 second standard. Such arrestors could also require changes to the fuel system vent lines in order to meet airplane refueling performance requirements, resulting in additional cost. Therefore, a minimum standard of 2 minutes and 30 seconds is appropriate for preventing the propagation of flames from outside the tank through the fuel tank vents into fuel tank vapor spaces.

C. Summary of the NPRM

On August 1, 2014, the FAA issued an NPRM proposing to amend §§ 25.975, 121.1119, and 129.119. The Federal Register published that NPRM as Notice No. 14–07, Docket No. FAA-2014-0500, on August 15, 2014 (79 FR 48098). In that NPRM, the FAA proposed to require that fuel tank designs prevent fuel tank explosions, for a minimum of 2 minutes and 30 seconds, caused by propagation of flames from outside the tank through the fuel tank vents into vapor spaces when any vent is continuously exposed to flame.

The comment period closed on September 29, 2014.

D. General Overview of Comments

The FAA received 19 comments from 10 commenters representing airplane manufacturers, regulators, a pilots association, and individuals. The Air Line Pilots Association (ALPA) and three individuals provided general comments in support of the amendments. The other commenters generally supported the proposed changes; however, some commenters suggested changes.

The FAA received comments on the following areas of the proposal:

- Minimum time for preventing flame propagation;
- Applicability of new §§ 121.1119 and 129.119;
- Applicability and compliance time for newly manufactured airplanes; and
- Economic evaluation.

III. Discussion of the Final Rule and Public Comments

A. “Fuel tank vents and carburetor vapor vents” (§ 25.975)

With some modification from what the FAA proposed in the NPRM, this final rule adds a new paragraph, (a)(7), to § 25.975 to require fuel tank vent systems be designed to prevent the propagation of flames from outside the tank through the fuel tank vents into fuel tank vapor spaces for a period of 2 minutes and 30 seconds. The intent of this new requirement is to prevent or delay fuel tank explosions to allow safe evacuation of passengers and crew, and to allow emergency personnel time to reach an accident and provide assistance.

Boeing recommended replacing the proposed minimum time requirement of 2 minutes and 30 seconds with 90 seconds. Boeing commented that, to meet the proposed requirement, current Boeing airplanes may need to be redesigned, and current flame arrestor installations would have to be redesigned and recertified, both at significant cost. Boeing also commented that 90 seconds would allow sufficient time to evacuate passengers safely and be consistent with other evacuation time limits in § 25.803.

When considering Boeing’s comment that its designs would not meet the proposed 2 minute and 30 second delay, the FAA requested certification data for in-production Boeing designs and confirmed that existing Boeing flame arrestors meet the 2 minute and 30 second standard. Boeing’s own data, from its approved flame arrestor

installations, do not support its suggested standard of only 90 seconds. Also, as previously discussed, research data from accidents used to develop the requirements in § 25.856 do not support Boeing's position that a 90-second standard would provide adequate safety.

Lockheed Martin Aeronautics Company and Embraer commented their currently approved flame arrestor systems may not comply with the standard and would necessitate redesign of the systems for new production airplanes.

While the FAA determined that most¹⁴ of these systems would not require redesign, the FAA has concluded that it would not be cost-effective to require redesign of any existing systems that do not meet the new standard. Therefore, we have revised the provisions of §§ 121.1119 and 129.119 to prohibit operation of new production airplanes unless an FAA-approved means to prevent fuel tank explosions caused by propagation of flames from outside the fuel tanks is installed and operational. Both of these regulations permit the continued installation and operational use of previously approved means to prevent such fuel tank explosions. For those airplanes that do not currently have such approved means, the design approval holder would be required to show compliance with the new standard to obtain approval.

Lockheed requested a reduction of the minimum time requirement to 120 seconds for airplanes approved for cargo-only operations due to shorter evacuation times needed for fewer occupants in the airplane. In addition, Lockheed contends that the FAA has previously accepted designs on cargo airplanes that did not meet the 2 minute and 30 second standard.

¹⁴ The previously approved Lockheed 328 and Embraer flame arrestors would not have met the 2 minute and 30 second requirement.

Lockheed raised a valid point regarding the Lockheed 382 cargo airplanes equipped with flame arrestors. In considering this request, the FAA reviewed past certification data and supporting documentation submitted by Lockheed. Lockheed amended the design of the Lockheed 382 to include fuel tank vent flame arrestors in 2008. At that time, there was no regulatory requirement for a 2 minute and 30 second capability for the fuel tank vent flame arrestors. Therefore, based on retrofit of flame arrestors into an existing design and the operation of the airplane for cargo use only, the FAA approved a 2-minute capability for the flame arrestor installation on those airplanes.

Since 2008, however, the FAA has determined that cargo operations should not be a basis for a fuel vent protection regulatory requirement. Cargo airplanes are commonly modified and operated in various configurations that may allow carriage of supernumeraries and passengers. Providing longer fuel tank vent protection time may also prevent a fuel tank explosion that endangers ground support or emergency response personnel. Therefore, the FAA does not agree with Lockheed that a 2-minute standard should be adopted as the standard for all cargo transport airplanes, and the FAA is adopting § 25.975(a)(7) as proposed.

Embraer requested the rule be limited to preventing fuel tank explosions following a crash landing. Embraer supported its request by inferring that § 25.979, “Pressure fueling system,” and associated refueling procedures included in aircraft maintenance manuals address explosions during refueling and other ground operating conditions.

The FAA does not agree that the regulation should only apply to post-crash scenarios. In addition to fuel and oil spillage following survivable accidents, fires outside

of the airplane fuel tanks have been caused by fuel spilled during refueling and leaking airplane fuel tanks. These external fires may ignite fuel vapors that exit the fuel tank vents, resulting in flames traveling back through the vent lines into the fuel tank, causing fuel tank explosions. Therefore, this amendment addresses any event that could result in fire outside the fuel tanks, including refueling operations. Additionally, it is not redundant of § 25.979 because that section only addresses the design of the fueling system, which would not address or prevent situations of spillage from improper fueling practices or leakage from malfunctioning fueling systems.

The FAA made minor editorial changes to new paragraph (a)(7) in § 25.975 from what was proposed in the NPRM. The edits are for clarity and do not change the effect of the regulation.

B. Amendment to §§ 121.1119 and 129.119, “Fuel tank vent explosion protection”

With minor modifications from what was proposed in the NPRM, the FAA is adding new operations rules requiring operators of certain transport category, turbine powered airplanes produced more than 2 years after the effective date of this rule to have FAA-approved fuel tank vent fire protection means to prevent fuel tank vent explosions. This requirement is added to 14 CFR part 121, “Operating Requirements: Domestic, Flag, and Supplemental Operations,” and 14 CFR part 129, “Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage.” As discussed above, the FAA is not requiring manufacturers with currently approved flame arrestors to redesign their systems in order to comply with §§ 121.1119 and 129.119.

This amendment applies to subject airplanes that are issued an original airworthiness certificate beginning 24 months after the effective date of this final rule. The FAA based the 24-month compliance period on time estimates needed to design and develop fuel tank vent protection means for existing airplane models that do not have previously approved flame arrestors. Flame arrestor technology is currently available. Adaptation of this technology, and the certification and incorporation of the design into airplanes currently in production should be achievable within the two-year compliance time.

Bombardier recommended withdrawal of the proposed changes to parts 121 and 129, citing a lack of demonstrated safety improvement and the added cost of flame arrestors.

The FAA accounted for the cost to Bombardier products in the economic evaluation for the NPRM and found safety benefits based on industry recommendations and the risks documented in the ADs issued on certain airplane models. In addition to the 737 AD discussed in paragraph IIB, the FAA has issued other ADs to either require flame arrestors or verify their functionality on the Lockheed Model 1649A piston airplane,¹⁵ Boeing Models 707 and 720,¹⁶ the Beech Model 400A,¹⁷ and the Lockheed Model 382.¹⁸ The FAA has found that there is a safety benefit and economic justification to include a requirement in this amendment to bring all newly produced airplanes that are subject to this rulemaking that will operate under the requirements of § 121.1119 or § 129.119 up to

¹⁵ AD 59-20-02 LOCKHEED: Effective October 15, 1959, for items (1) and (2) and December 1, 1959, for item (3).

¹⁶ AD 67-23-02 BOEING: Amendment 39-462. Effective September 10, 1967.

¹⁷ AD 92-16-14 BEECH: Amendment 39-8323; Docket No. 92-NM-95-AD; effective September 1, 1992.

¹⁸ AD 2011-15-02 LOCKHEED: Amendment 39-16749; Docket No. FAA-2010-1305; effective August 19, 2011.

the level of safety established for the airplanes that are subject to these referenced ADs. Therefore, the FAA did not make any changes as a result of this comment.

Embraer stated that it believes that the FAA's intent is to address specifically those higher capacity airplanes operating in scheduled airline service, and to prevent operators from escaping compliance by reducing the passenger or payload capacity to below the specified limits; and it believes that the FAA's intent is not to also require compliance for certain business jets that happen to be on a type certificate. Embraer noted that these smaller airplanes do not operate in part 121, but there are foreign-based charter operators who operate airplanes leased from U.S. owners who have FAA operating certificates issued under § 129.1(b). Embraer noted that if these operators were U.S. based, they would be part 135 air taxi operations that would not be subject to the requirements proposed in the NPRM. Therefore, Embraer suggested that the proposed § 129.119 be revised to except the Bombardier CL-600-2B16 and the Embraer EMB-135BJ.

The FAA does not concur with the request to exclude specific models from coverage under § 129.119. As proposed, this section would exclude airplanes with capacities below the specified thresholds. However, as Embraer recognizes, the proposed § 129.119(a) included the following qualifier: "as a result of original type certification or later increase in capacity." The proposed § 121.1119(a) contained this same language. Embraer correctly points out that, for certain Embraer and Bombardier models, this would have the unintended effect of applying the requirements to business jets that are included on the same type certificates as larger air carrier airplanes, even though the business jets have capacities below those specified in §§ 129.119 and 121.1119. To

prevent the requirement from applying to these smaller airplanes, the FAA has eliminated the quoted qualifier in both identified sections in this final rule. In the future, if either Embraer or Bombardier choose to amend the type certificates to increase the capacity of these airplanes above the specified thresholds, §§ 129.119 and 121.1119 would apply to those newly produced airplanes.

C. Comments on the Economic Evaluation

EASA supported the proposal but commented that the regulatory economic evaluation should be revised to include the ATR42 and ATR 72 (ATR42/72). EASA noted these airplane models do not have flame arrestors in the fuel tank vents and would be affected by the flame arrestor requirement for newly manufactured airplanes entering U.S. service under parts 121 and 129.

The FAA does not agree. Certification costs incurred by foreign manufacturers are not included in cost analyses of proposed U.S. regulations. Costs incurred by U.S. operators of foreign-produced airplanes are included in such analyses. For this final rule, however, the FAA estimates these costs to be minimal for newly produced ATR42/72 airplanes, since the FAA expects the annual number of ATR42/72 deliveries to be few, if any. The FAA has determined that there are no planned deliveries of ATR42/72 airplanes to U.S. airline operators after 2018 when the final rule will take effect. Therefore, the FAA is not revising the economic analysis to include the ATR42/72.

Embraer also commented that the cost of the rule should be revised to include modification of an additional airplane model. One of its airplane models is designed to open a secondary refueling valve when the airplane being refueled does not have a flame arrestor. The primary vent outlets located near the wing tips have previously approved

flame arrestors that meet the rule. The only affected airplane model with the open secondary vent design is the EMB145. Embraer currently has no orders or forecast deliveries for EMB145 airplanes with the unique secondary refueling vent.

In addition, even if future sales of this model occur, costs incurred by foreign manufacturers are not included in the costs of compliance, as costs directly attributable to foreign entities are not included in the cost-benefit analysis of U.S. regulations.

Therefore, the FAA did not change the economic evaluation in response to this comment.

D. Differences between the NPRM and the Final Rule

The FAA is adopting these rules as proposed in the NPRM with modifications as discussed above. Specifically, the FAA is revising §§ 121.1119 and 129.119 to remove the qualifying statement “as a result of original type certification or later increase in capacity,” and to require only that fuel tank vent system explosion prevention means for new production airplanes be FAA-approved.

IV. Regulatory Notices and Analyses

A. Regulatory Evaluation

Changes to Federal regulations must undergo several economic analyses. First, Executive Orders 12866 and 13563 direct that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Pub. L. 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96-39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, the Trade Act requires agencies to consider international

standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of \$100 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of the final rule. The FAA suggests readers seeking greater detail read the full regulatory evaluation, a copy of which is in the docket for this rulemaking.

In conducting these analyses, the FAA has determined that this final rule: (1) has benefits that justify its costs; (2) is not an economically "significant regulatory action" as defined in section 3(f) of Executive Order 12866; (3) is not "significant" as defined in DOT's Regulatory Policies and Procedures; (4) will not have a significant economic impact on a substantial number of small entities; (5) will not create unnecessary obstacles to the foreign commerce of the United States; and (6) will not impose an unfunded mandate on state, local, or tribal governments, or on the private sector by exceeding the threshold identified above. These analyses are summarized below.

Total Costs and Benefits of this Final Rule

The FAA finds the final rule to be cost-beneficial because the costs of the rule are low enough that the benefits of preventing just two fatalities outweigh the expected costs (\$4.9 million in present value benefits versus \$4.4 million in present value costs). If this action is not taken, a hazard will continue to exist even though effective and low-cost means are available to minimize or eliminate it.

Who is Potentially Affected by this Rule?

This rule applies to applicants for new type certificates, amended and supplemental type certificates involving significant product-level changes, and manufacturers and operators of currently certificated airplanes produced two or more years after the effective date of this rule. This rule does not require retrofit of the existing fleet.

Principal Assumptions and Sources of Information

- Discount rate is 7 percent (Office of Management & Budget, Circular A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,” October 29, 1992, p. 8).
- Value of statistical life (VSL) begins at \$9.2 million in 2013, and increases thereafter by an annual growth factor of 1.0107. Memorandum: Guidance on Treatment of the Economic Value of a Statistical Life in Department Analyses—2014 Adjustment, June 13, 2014. United States, Office of the Secretary of Transportation.
- For small part 25 manufacturers: An FAA study anticipates two U.S. airplane certifications in next 10-year period, twenty-one annual U.S. deliveries per U.S. certification; three foreign airplane certifications in next 10-year period, eleven annual U.S. deliveries per foreign certification, 15-year airplane production run; 30-year retirement age. Internal FAA study.
- Current airplane models that could be affected by production cut-in requirement: Bombardier Dash 8, CJ-700, and CJ-900. FAA 2013 Fleet Forecast, Fleet

Forecast Sheet “FAA U.S. Airlines 2013-2013 1-18-2103,” “Totals & FAA Tables.”

- The period of analysis for new certifications is 45 years to account for a complete product life cycle determined by a 15-year production period and a 30-year service period.
- Certification cost estimates for part 25 airplanes—Small U.S. part 25 airplane manufacturers.
- Maintenance cost per airplane (every four years) for Bombardier CJ-700/CJ-900 regional jets (subject to production cut-in)--\$240. This estimate is much lower than the U.S. estimate because it is for passenger airplane models while the U.S. estimate is for business jet models. Since business jets are more prone to sit for extended periods of time, their flame arrestors can more easily be clogged by ice, mud daubers, or other debris, thus requiring more frequent and longer maintenance.
- Minimal fuel costs as flame arrestors weigh between 2 and 4 pounds each.

Costs of this Final Rule

The costs of the final rule are engineering, production, and maintenance compliance costs for newly certificated part 25 airplanes and for the production cut-in of part 25 airplanes used in part 121 operations. The FAA first estimates compliance costs for new certifications and then for the production cut-in.

For newly certificated airplanes, compliance costs consist of engineering and production costs of U.S. manufactured airplanes delivered to U.S. operators and maintenance costs of both U.S. and foreign airplanes delivered to U.S. operators. U.S.

part 25 manufacturers directly incur the engineering and production costs while U.S. operators directly incur the maintenance costs. Engineering and production costs incurred by foreign manufacturers are not included in the costs of compliance, as costs directly attributable to foreign entities are not included in the U.S. social cost and benefit analysis of U.S. regulations.

To calculate the cost of new U.S. certifications, the FAA assumes that all new certifications will be approved one year after the effective date of the rule, with production beginning one year later. Using an airplane life cycle model, the FAA estimates the economic impact for two new certificates, production of 21 airplanes/certificate/year, production runs of 15 years and an airplane retirement age of 30 years. Compliance costs per year are calculated over an airplane life cycle of 45 years.

Cost estimates were solicited from small part 25 manufacturers because large airplane manufacturers (Boeing and Airbus) are already compliant with the final rule. These cost estimates are shown in the table below.

**INDUSTRY COST ESTIMATES USING FLAME ARRESTORS TO COMPLY
WITH FINAL RULE (\$ 2013)**

Cost Category	Cost	Notes
Nonrecurring Engineering Costs	\$ 142,000	per model
Recurring Cost (Hardware & Installation)	\$ 3,000	per model (two flame arrestors @ \$1,500 each)
Maintenance Cost (U.S. manufactured airplanes)	\$ 415	per airplane annually
Maintenance Cost (Bombardier manufactured airplanes)	\$ 240	per airplane every 4 years

The basic cost estimates consist of nonrecurring (one-time) engineering costs, production costs for two flame arrestors per airplane (one per fuel tank) and maintenance

costs per airplane per year. The Bombardier maintenance cost estimate is used for estimating production cut-in costs of compliance.

Incorporating the industry cost estimates into the airplane life cycle model, the FAA finds total costs for new certification airplanes to be \$16.2 million with present value of \$4.2 million. \$2.2 million of these costs (present value \$1.2 million) are directly incurred by U.S. manufacturers, and \$14.0 million (present value \$2.1 million) are directly incurred by U.S. operators.¹⁹ For details, see the full regulatory evaluation in the docket.

In addition to the requirement applying to new certifications, the final rule will also require a production cut-in for currently produced part 25 airplanes used in part 121 operations.²⁰ To calculate this cost, the FAA first notes that the only currently produced and U.S.-operated airplane models not already in compliance are the Bombardier Dash 8 turboprops and Bombardier CRJ-700/CRJ-900 regional jets. The final rule will apply to these Bombardier models produced beginning in 2018. Since the FAA forecasts no Dash 8 deliveries to U.S. airline operators after 2017, the FAA expects no Dash 8 compliance cost for those operators.

The FAA does forecast the delivery of 338 CRJ-700 and 161 CRJ-900 model airplanes to U.S. airline operators over the period 2018-2033. The engineering and production compliance costs for these airplanes are not included in our cost estimates because, as noted above, costs directly incurred by foreign entities are not included in the cost and benefit analysis of U.S. regulations. Accordingly, for these airplanes the FAA

¹⁹ Details may not sum to totals due to rounding.

²⁰ We do not estimate costs for the analogous part 129 requirement as these costs are directly incurred by foreign operators.

assesses the impact on U.S. operators only, using Bombardier's maintenance cost estimate of \$240 every four years. Allocating this cost as \$60 annually and assuming a production period of 16 years, the FAA calculates the maintenance costs for these airplanes from the first year of service to the retirement year of the last airplanes produced, using a procedure analogous to that used for new certification airplanes. The FAA finds these costs to operators to be \$898,200 with present value \$178,439.

Production cut-in costs of \$898,200 (present value \$178,439) added to new certification airplane costs of \$16.2 million (present value \$4.2 million) yield total rule costs of \$17.1 million (present value \$4.4 million).

Benefits of this Final Rule

Notwithstanding the absence of post-crash fuel tank explosions in recent years and lacking other sufficient bases upon which to estimate future risks, the merits of the final rule can be assessed by considering the number of fatalities that would need to be prevented to offset the costs of the rule.

The FAA estimates the breakeven benefits of the rule by estimating the number of averted fatalities necessary to offset the \$4.4 million present value costs of the rule. The FAA finds that just two averted fatalities would offset these estimated costs. For details see the full regulatory evaluation in the docket.

B. Regulatory Flexibility Determination

The Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96-354) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions

subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration.” The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions. Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

All small U.S. manufacturers affected by this rule are wholly owned subsidiaries of large companies, who have more than 1,500 employees (the small business criterion for aircraft manufacturing) and, therefore, are not classified as small entities by the Small Business Administration. Part 121 operators will be directly affected by the average \$415 annual maintenance cost per airplane. These costs are minimal, especially compared to the high cost of new part 25 airplanes. The FAA received no comments on this same finding in the NPRM.

If an agency determines that a rulemaking will not result in a significant economic impact on a substantial number of small entities, the head of the agency may so certify under section 605(b) of the RFA. Therefore, as provided in section 605(b), the head of

the FAA certifies that this rulemaking will not result in a significant economic impact on a substantial number of small entities.

C. International Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96-39), as amended by the Uruguay Round Agreements Act (Pub. L. 103-465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

The FAA has assessed the effect of this final rule and determined that its purpose is to ensure the safety of U.S. civil aviation. Therefore, the rule is in compliance with the Trade Agreements Act.

D. Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of \$100 million or more (in 1995 dollars) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a “significant regulatory action.” The FAA currently uses an inflation-adjusted value of \$155.0 million

in lieu of \$100 million. This final rule does not contain such a mandate; therefore, the requirements of Title II of the Act do not apply.

E. Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. The FAA has determined that there is no new requirement for information collection associated with this final rule.

F. International Compatibility and Cooperation

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to conform to International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has determined that there are no ICAO Standards and Recommended Practices that correspond to these proposed regulations.

G. Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 312f and involves no extraordinary circumstances.

V. Executive Order Determinations

A. Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. The agency determined that this action will not have

a substantial direct effect on the States, or the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, does not have Federalism implications.

B. Executive Order 13211, Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA analyzed this final rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). The agency has determined that it is not a “significant energy action” under the executive order, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

VI. How to Obtain Additional Information

A. Rulemaking Documents

An electronic copy of a rulemaking document may be obtained by using the Internet —

1. Search the Federal eRulemaking Portal (<http://www.regulations.gov>);
2. Visit the FAA’s Regulations and Policies Web page at http://www.faa.gov/regulations_policies/ or
3. Access the Government Printing Office’s Web page at <http://www.gpo.gov/fdsys/>.

Copies may also be obtained by sending a request (identified by notice, amendment, or docket number of this rulemaking) to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267-9680.

B. Comments Submitted to the Docket

Comments received may be viewed by going to <http://www.regulations.gov> and following the online instructions to search the docket number for this action. Anyone is able to search the electronic form of all comments received into any of the FAA's dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.).

C. Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires the FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. A small entity with questions regarding this document, may contact its local FAA official, or the person listed under the FOR FURTHER INFORMATION CONTACT heading at the beginning of the preamble. To find out more about SBREFA on the Internet, visit http://www.faa.gov/regulations_policies/rulemaking/sbre_act/.

List of Subjects

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 121

Air carriers, Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 129

Air carriers, Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends parts 25, 121, and 129 of title 14, Code of Federal Regulations as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702 and 44704.

2. Amend § 25.975 by revising paragraphs (a)(5) and (6) and adding paragraph (a)(7) to read as follows:

§ 25.975 Fuel tank vents and carburetor vapor vents.

(a) * * *

(5) There may be no point in any vent line where moisture can accumulate with the airplane in the ground attitude or the level flight attitude, unless drainage is provided;

(6) No vent or drainage provision may end at any point—

(i) Where the discharge of fuel from the vent outlet would constitute a fire hazard; or

(ii) From which fumes could enter personnel compartments; and

(7) Each fuel tank vent system must prevent explosions, for a minimum of 2 minutes and 30 seconds, caused by propagation of flames from outside the tank through the fuel tank vents into fuel tank vapor spaces when any fuel tank vent is continuously exposed to flame.

* * * * *

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

3. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40113, 40119, 41706, 42301 preceding note added by Pub. L. 112-95, sec. 412, 126 Stat. 89, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44729, 44732; 46105; Pub. L. 111-216, 124 Stat. 2348 (49 U.S.C. 44701 note); Pub. L. 112-95, 126 Stat 62 (49 U.S.C. 44732 note).

4. Add § 121.1119 to subpart AA to read as follows:

§ 121.1119 Fuel tank vent explosion protection.

(a) *Applicability.* This section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that have:

(1) A maximum type-certificated passenger capacity of 30 or more; or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) *New production airplanes.* No certificate holder may operate an airplane for which the State of Manufacture issued the original certificate of airworthiness or export airworthiness approval after August 23, 2018 unless means, approved by the Administrator, to prevent fuel tank explosions caused by propagation of flames from outside the fuel tank vents into the fuel tank vapor spaces are installed and operational.

PART 129—OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

5. The authority citation for part 129 continues to read as follows:

Authority: 49 U.S.C. 1372, 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901–44904, 44906, 44912, 46105, Pub. L. 107-71 sec. 104.

6. Add § 129.119 to subpart B to read as follows:

§ 129.119 Fuel tank vent explosion protection.

(a) *Applicability.* This section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that have:

(1) A maximum type-certificated passenger capacity of 30 or more; or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) *New production airplanes.* No certificate holder may operate an airplane for which the State of Manufacture issued the original certificate of airworthiness or export airworthiness approval after August 23, 2018 unless means, approved by the Administrator, to prevent fuel tank explosions caused by propagation of flames from outside the fuel tank vents into the fuel tank vapor spaces are installed and operational.

Issued under authority provided by 49 U.S.C. 106(f) and 44701(a) in Washington, DC, on June 7, 2016.

Michael P. Huerta,
Administrator.

[FR Doc. 2016-14454 Filed: 6/23/2016 8:45 am; Publication Date: 6/24/2016]